



US Army Corps
of Engineers

Upper Mississippi River - Illinois Waterway System Navigation Study

UMR-IWW System Navigation Study Newsletter

June 1995

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INTERAGENCY MEETING AT WATERWAYS EXPERIMENT STATION

The Navigation Environmental Coordination Committee is an interagency committee that provides a medium for information exchange and an avenue for input into the Navigation Study. The committee meets quarterly to discuss Navigation Study issues, and recently held a meeting at the U.S. Army Corps of Engineers Waterways Experiment Station

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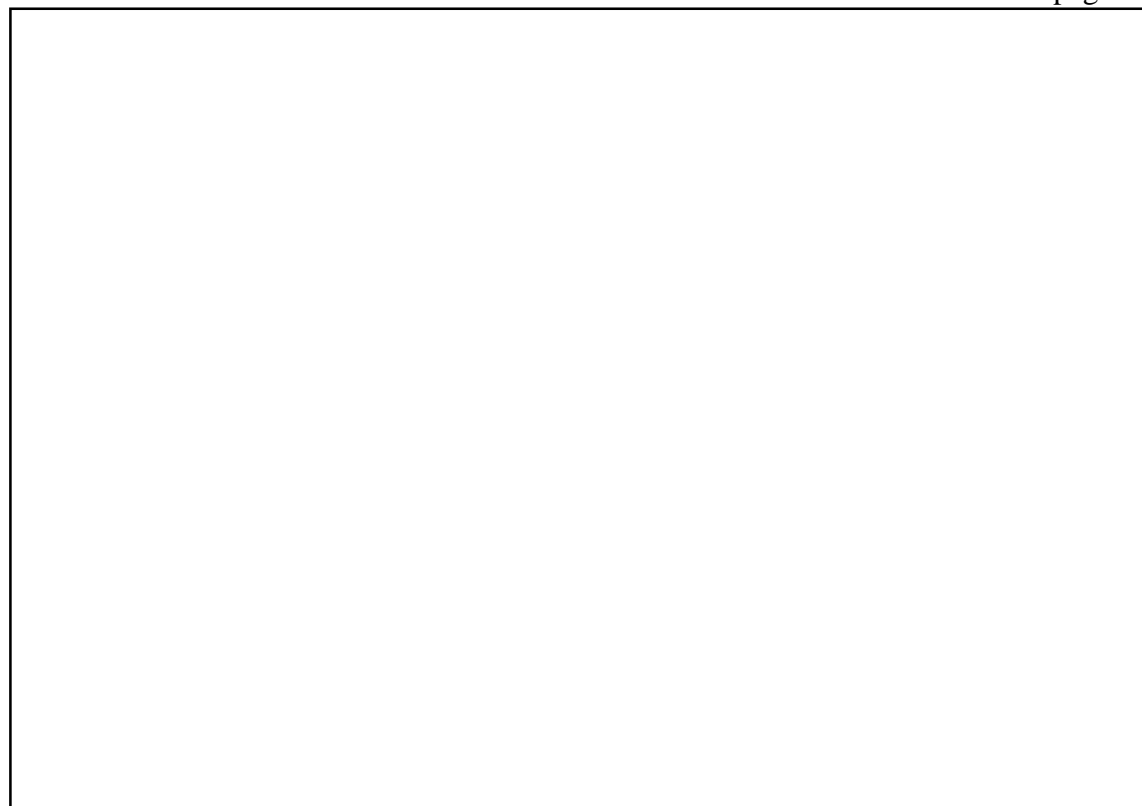
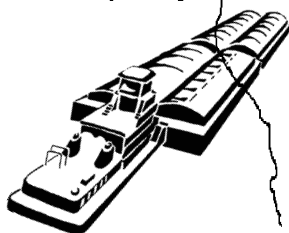


Minnesota
Iowa



Wisconsin
Illinois

Missouri



Group photo of participants at the May 2 & 3, 1995, meeting at WES. The model in the foreground has a radio controlled towboat that is testing a guide wall extension of the lock to see if out-draft problems can be decreased, reducing lockage time and making it safer to approach the lock. ◊

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(WES) research facility at Vicksburg, Mississippi, on May 2 and 3, 1995.

The meeting provided committee members (representatives of study area states, U.S. Fish and Wildlife Service, and U.S. Environmental Protection Agency) and other members of the public the opportunity to view facilities and studies in-progress that WES is performing for the Navigation Study. Highlights included the physical forces model (with towboat to scale) in which segments of the Mississippi River and Illinois Waterway are simulated, navigational models of Locks and Dams 22 and 25, aquatic plant cultures, tanks in which the cultured plants will be used for "aquatic plant effects" studies, current laboratory studies on mussels to exemplify the potential for similar navigation related studies, and computer demonstrations of hydraulic/numerical modeling. ○

NAVIGATION STUDY CONTRIBUTORS

The Navigation Study is one of the largest and most complex studies of the Upper Mississippi River - Illinois Waterway System ever undertaken. Each work group, Economics, Engineering, and Environmental, relies on research contributors in the academic and scientific community who have expertise in specialized areas. The following is a partial list by work group of organizations that have been involved in Navigation Study efforts to date.

ECONOMICS WORK GROUP

- Tennessee Valley Authority
- Lafayette University, Pennsylvania
- Jack Faucett and Associates
- Transportation Research and Analysis Center
- Corps of Engineers Institute for Water Resources
- University of Maryland

These contributors are performing physical and computer modeling of navigation effects and sediment transport; and are conducting future without project and unconstrained traffic projections and the Regional Economic Development Analysis.

ENGINEERING WORK GROUP

- Corps of Engineers Waterways Experiment Station
- Sverdrup Corporation

- University of Virginia
- Michigan State University
- Corps of Engineers Civil Engineering Research Lab
- Shannon and Wilson, Inc.
- Crawford, Murphy & Tilly, Inc.
- Ben C. Gerwick, Inc.

This group is providing expertise and assistance in conducting physical and numerical modeling of the river and lock and dam sites, evaluating small scale measures, developing reliability models (to predict future rehabilitation needs), evaluating innovative lock design efforts, and performing corrosion analysis.

ENVIRONMENTAL WORK GROUP

- Corps of Engineers Waterways Experiment Station
- Environmental Management Technical Center (EMTC) of the National Biological Service
- Illinois State Water Survey

These contributors are performing physical and computer modeling of navigation effects and sediment transport; conducting aspects of the fish, plants, and mussel studies; and collecting and analyzing data.

HISTORIC PROPERTIES WORK GROUP

- Bear Creek Archeology, Inc.
- Illinois State Museum Society

These organizations are collecting and consolidating existing information on known archeological and historical sites within the study area.

More organizations will be involved as the study progresses and additional work efforts are initiated. ○

ENVIRONMENTAL IMPACT STATEMENT

The preparation of an Environmental Impact Statement (EIS) is an integral and often complex part of many Corps planning efforts. Currently, there are several pieces of Federal legislation and Executive Orders and Memoranda which may need to be addressed in an EIS. While not every one of these requirements apply to each project, several usually do. The following is a list of Federal laws and regulations which apply in whole or

part to the Navigation Study EIS:

- Clean Air Act (as amended)
- Clean Water Act (as amended)
- Endangered Species Act (as amended)
- Federal Water Project Recreation Act (as amended)
- Fish and Wildlife Coordination Act (as amended)
- National Historic Preservation Act (as amended)
- National Environmental Policy Act (as amended)

Additional legislation such as the Wild and Scenic Rivers Act, the Farmland Protection Policy Act, or Memoranda like Executive Order 11990 on protection of wetlands may be applicable to specific situations. ○

WATERWAYS EXPERIMENT STATION (WES)

To support environmental and engineering studies, the U.S. Army Corps of Engineers is performing much of the needed analysis at the Waterways Experiment Station, the only research facility of its kind in the world. WES was established at Vicksburg, MS, by the Army Corps of Engineers in 1927. Its original purpose was to test flood control plans for the Mississippi River following the disastrous flood of 1927. WES is now a 700-acre research, development, and testing complex with six laboratories: (1) geotechnical (2) structures; (3) environmental, (4) coastal engineering, (5) research, and (6) information technology.

WES is working on important aspects of the Navigation Study by developing and testing both physical and computer models of the river and navigation process. Some of the modeling tasks that WES is undertaking include:

(1) Physical modeling of river cross sections and lock and dam sites along the Mississippi River and Illinois Waterway. This work will help evaluate the physical forces of a tow as it moves through the water and the hydraulic impacts of changes to lock and dam facilities. (See following article for further information on physical forces modeling.)

(2) Refined hydrodynamic (computer) modeling tools that will define the flow field (i.e., ambient conditions in the water column) and other modeling tools that will

predict the effects of tow passage on the flow field.

(3) Sedimentation modeling tools that simulate tow induced sediment resuspension and predict both short term and long term sedimentation impacts from increased tow traffic in the main channel, side channels, and especially the backwaters areas.

(4) A hydraulic classification scheme of the Upper Mississippi River System that categorizes aquatic area types throughout the system based on their hydraulic characteristics.

(5) Portions of the plant and mussel studies are being conducted at the environmental labs at WES.

(6) WES is looking at a less costly filling and emptying system for the locks. While filling and emptying the lock involves a small segment of the total lock transit time, developing an economical system could significantly reduce total construction cost. Currently the culvert intakes and emptying valves are located in the lock wall. New designs could put this system in the lock floor. This could result in simplified construction, thinner lock walls, and considerable cost savings. ○

Studies of the impacts of navigation on aquatic plants are being conducted at WES.

NAVIGATION EFFECTS MODEL STUDY

A major effort of the Environmental Work Group is the physical modeling of navigation effects. A modeling facility at WES was built to specifically measure the hydrodynamic forces produced by moving tows on the Upper Mississippi River and Illinois Waterway. The model was completed in 1994, and testing of the second of four sites is nearing completion.

The model of the river segment (flume) is 400 feet long, 70 feet wide, and 4 feet deep. At a 1:30 model scale, this facility can model a reach of river over one mile long and 2,000 feet wide. It is equipped with a recirculating system capable of modeling river discharges of up to approximately 250,000 cubic feet per second. Tows can transit this "river" powered by a towboat carriage or by operation of a radio operated model towboat.

The physical model was first calibrated to field data collected by the Illinois State Water Survey (ISWS) at a site on the Illinois River near Kampsville, IL (river mile 35) and then again with data from a site on the Upper Mississippi at Clarks Ferry (river mile 468).

Data obtained from this model will be used to develop general equations and rules for predicting tow induced forces at other sites on the river and will be linked with biological models to evaluate system-wide impacts of tow passage. ○

MODELING INTEGRATION AND SIMULATION TEAM (MIST)

The environmental component of the Upper Mississippi River - Illinois Waterway System Navigation Study is composed of several interdependent parts (such as sediment transport and fish, plant, and mussel studies) that must "fit" together in proper sequence and scale to achieve accurate study results. For example, the work on sediment resuspension (a physical effect) will be used to help determine the impacts of increased traffic on plants (a biological response). To accomplish this, dialogue and interaction between the interdependent parts are crucial. The forum for this dialogue and interaction is the Modeling Integration and Simulation Team, or MIST.

The team has membership representatives of the inter-dependent study parts and meets approximately four times a year. In addition to promoting dialogue and interaction, the team will aid in developing the scenarios that define the "future with project condition" and will also apply modeling tools to evaluate environmental impacts. ○

VOLUME AND VARIETY OF FREIGHT TRAFFIC

Commodity movements on the Upper Mississippi River and Illinois Waterway are very diverse. Although grain shipments to the gulf and coal shipments to numerous power plants provide the largest share, many other commodities are also shipped. The following chart displays the diversity of products being shipped on the Upper Mississippi River.

Freight Traffic 1992 *

MINNEAPOLIS, MN, TO THE MOUTH OF THE MISSOURI RIVER

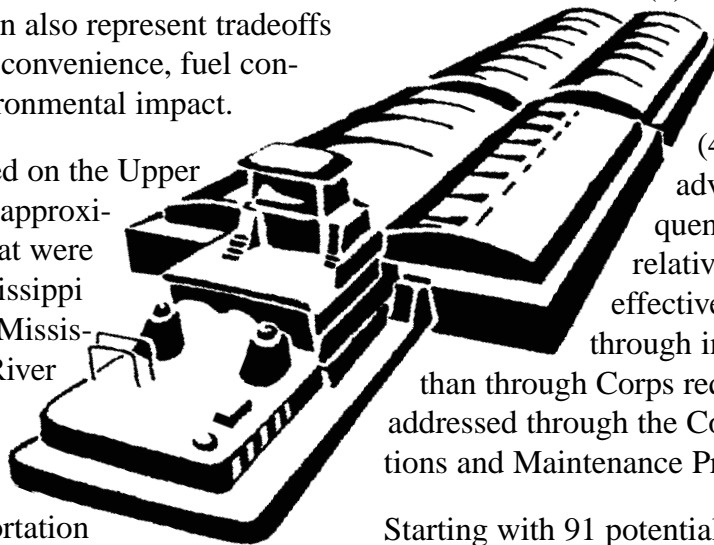
| COMMODITY | (thousand tons) |
|--------------------------------------|-----------------|
| Farm and farm products | 48,383 |
| Coal and lignite | 9,626 |
| Petroleum and petroleum products | 9,500 |
| Chemicals and related products | 3,855 |
| Fertilizers | 3,855 |
| Soil, sand, gravel, stone | 3,701 |
| Lime, cement, and glass | 1,873 |
| Non-metal mineral | 1,697 |
| Iron ore and scrap | 898 |
| Non-ferrous products | 561 |
| Non-ferrous ores and scrap | 327 |
| Slag | 326 |
| Forest products | 57 |
| Sulfur, clay, and salt | 50 |
| Pulp and waste paper | 45 |
| Manufactured equipment and machinery | 44 |
| Marine shells | 17 |
| Primary wood products | 13 |
| Paper products | 1 |
| TOTAL | 86,177 |

* 1992 figures are used because 1994 figures are not yet published and the 1993 flood created atypical data. (Data compiled by the Waterborne Commerce Center, New Orleans, LA.)

These 20 groupings represent 90 separate types of commodities commonly shipped up and down the river. These commodities would fill over 57,000 barges (1,500-ton capacity each) and would stretch over 2,100 miles if placed end to end.

To give an idea of the logistics of shipping 86 million tons by alternate carriers, these goods would fill over 861,000 rail cars (100-ton capacity each) and over 3.4 million tractor trailers (25-ton capacity each). The total 1992 tonnage on the Upper Mississippi River would fill a line of tows stretching over 950 miles, a 9,000-mile-long train, or a 36,000-mile-long caravan of 55-foot tractor trailers. These various modes of transportation also represent tradeoffs in terms of transport time, convenience, fuel consumption, safety, and environmental impact.

The 86 million tons shipped on the Upper Mississippi is only part of approximately 491 million tons that were shipped on the entire Mississippi River in 1992. The Upper Mississippi and the Mississippi River System as a whole move large amounts of commodities and are a vital part of our nation's transportation network. ○



scale measures for possible implementation, have been completed to date. This method involved:

- (1) identification of the universe of small scale measures;
- (2) qualitative screening of small scale measures;
- (3) qualitative evaluation of costs and impacts; and
- (4) incorporation into systems analysis for final evaluation of costs and impacts.

The Corps of Engineers is guided by four criteria which are applicable to the evaluation of all projects: completeness, effectiveness, efficiency, and acceptability. From these general guidelines were developed eight specific criteria which reduced the list of possible small scale measures. These criteria eliminate measures that: (1) have no potential to reduce delays at locks, (2) are technically infeasible, (3) are considered unsafe, (4) have disproportionately adverse environmental consequences, (5) are too costly relative to impact, (6) are not cost effective, (7) should be pursued through industry cooperation rather than through Corps requirements, and (8) are addressed through the Corps of Engineers Operations and Maintenance Program.

Starting with 91 potential measures, this analysis yielded 17 deemed appropriate for further investigation as small scale investments. One of these measures, placing wicket gates in existing dams, was placed with large scale measures because of cost. The remaining 16 measures are grouped as follows:

- (1) Optimizing decisions (scheduling program)
- (2) Towboat power
 - (a) Helper boats
 - (b) Switch boats
 - (c) Self help

SMALL SCALE MEASURES

A frequent comment on the study is that it is solely focused on large scale measures, such as lock enlargement and new locks. However, the study does include an analysis on both small and large scale measures. A major portion of our current efforts are focused on evaluating small scale measures which may reduce lock delays significantly. Steps one and two of a four step process, to select the best small

- (3) Tow haulage equipment
 - (a) Powered traveling kevel
 - (b) Endless cable
 - (c) Extended guidewall
- (4) Mooring facilities adjacent to lock approach
- (5) Crew elements
 - (a) Universal couplers/hand winches
 - (b) Standard training for crews
- (6) Tolls and reports
 - (a) Congestion tolls
 - (b) Excess lockage time charges
 - (c) Lockage time charges
 - (d) Publish lockage times
- (7) Recreational vessels
 - (a) Scheduling of recreational vessel usage
 - (b) Recreational craft landing above and below lock

At peak traffic times, these small scale measures could have a significant positive impact on the reduction of lockage times. However, if traffic levels increase above a certian level, the time reduction provided by small scale measures may be insufficient to meet demand. Additional information on both the small and large scale measures being considered will be included in the next newsletter in preparation of the upcoming public involvement open houses. ○

STUDY CHANGES

Additional funding has been approved in each of the following work group areas. These changes will also result in a schedule change of nine months.

Engineering, \$525,000 - Innovative Lock Design Initiatives - This effort involves evaluating alternative lock designs which could lower construction

costs.

Economics, \$320,000 - Regional Economic Benefit Analysis - Meetings with the Governors' Liaison Committee and the Economics Coordination Committee demonstrated the need to determine the regional impacts of navigation.

Environmental:

(1) \$1,362,000 - Fish Impact Studies - Four separate studies will be combined into a single study. The study will incorporate an ecological risk assessment designed to determine risk to Upper Mississippi River fish populations from incremental increases in commercial navigation traffic.

(2) \$532,000 - Effects of Navigation on Aquatic Plants - Two studies have been combined into one study to examine: (a) flume experiments to determine wave and current damage to aquatic plants; (b) the effects of navigation on the distribution and establishment of aquatic plant propagules; and (c) the effects of suspended sediment and sediment deposition on aquatic plants.

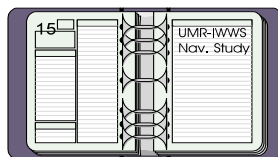
(3) \$3,330,300 - Math Modeling and the Effects of Tow Induced Sediment Resuspension on Backwaters and Side Channels - These funds will allow for the development of modeling tools which allow for the quantification of hydraulic effects of commercial navigation vessel passage, the extrapolation of effects to the system, and the coupling of physical effect with biological response. ○

OPEN HOUSES

The Public Involvement Work Group is in the process of finalizing its next public outreach program. We are currently planning to hold open house style meetings along the Upper Mississippi River and Illinois Waterway in the winter of 1995-96.

The purpose of the open houses is to provide an opportunity for the public to share their thoughts and ideas on the small and large scale measures that are

UPCOMING MEETINGS



Economics Coordination Committee

- August 29, 1995 - noon to 3:00 p.m.

Hotel Pere Marquette, Peoria, IL

Governors' Liaison Committee

- August 29, 1995 - 3:30 p.m. to 6:30 p.m.

Hotel Pere Marquette, Peoria, IL

Navigation Environmental Coordination Committee

- August 8, 1995 - 8:00 a.m. to 2:00 p.m.

Holiday Inn, Moline, IL

○ To get updated meeting information, call the toll-free telephone number, 800-USA(872)-8822.

Meeting announcements will be in the Public Involvement menu.

being examined in the Plan Formulation Phase of the Navigation Study. The goal is to provide an informational exchange between the meeting attendees and Corps personnel.

More details on the dates and locations of the open houses will be in the next edition of the Navigation Study Newsletter. ○



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Please check your mailing label for accuracy and make any changes on the label. Cut at the dotted line and attach the form to the inside of the enclosed sheet. Although we appreciate any comments you have, you do not have to complete the comment sheet when sending in your corrected address label. Fold the comment sheet and mail it so the postage-paid address is showing. Please return the corrected label by August 11, 1995. Thank you.

If we do not receive a response, we will continue sending you a newsletter at the current address on our data base. ○

NEW PROJECT MANAGER

The U.S. Army Corps of Engineers, Rock Island District, welcomes Mark Gmitro as Project Manager for the Navigation Study. Mr. Gmitro graduated from Iowa State University, Ames, IA, with Bachelor of Science degrees in Civil and Construction Engineering.

He has extensive project management experience working for the Corps in California and the Midwest. ○

FUTURE NEWSLETTERS

- Read about the upcoming open houses
- Additional information on the small and large scale measures being considered in the study

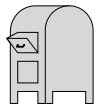
QUESTIONS?

○ for general study information, call Dave Tipple, study manager, at 309-794-5399 or write to the address below, ATTN: CENCR-PD-W.

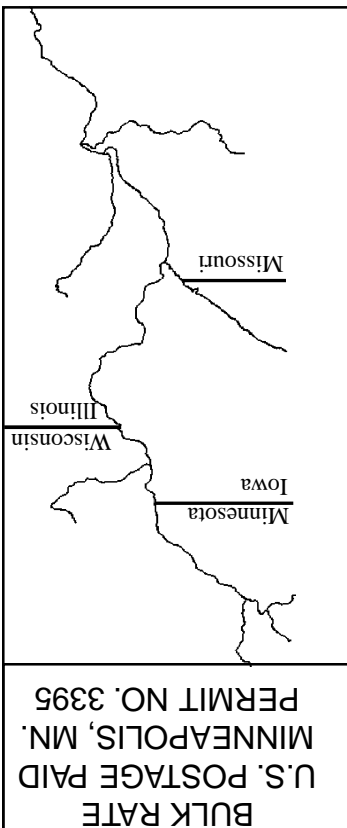
○ or for information on Public Involvement meetings, call the toll-free telephone number, 800-USA(872)-8822. Meeting announcements will be in the Public Involvement menu. Or call Kevin Bluhm, public involvement coordinator, at 612-290-5247, or write to the address below, ATTN: CENCR-PD-C/Bluhm.

○ if you want to be added to the mailing list for future newsletters, study updates, and meeting announcements, write to the address below, ATTN:CENCR-PD-C or call the toll-free telephone number and leave your information in the public involvement menu.

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